

5

**LIQUID DISH CLEANING COMPOSITIONS CONTAINING VITAMIN E-ACETATE**

10

15

**David F. Suriano**

**James Exarchakis**

**Evangelia S. Arvanitidou**

LIQUID DISH CLEANING COMPOSITIONS CONTAINING VITAMIN E ACETATE

Field of Invention

This invention relates to a liquid dish cleaning composition containing Vitamin E acetate, having good viscosity and good foaming, grease cutting, rinsing and mildness properties.

Background of the Invention

The present invention relates to novel light duty liquid Vitamin E-Acetate containing detergent compositions with an improved viscosity, high foaming and good grease cutting properties.

The prior art is replete with light duty liquid detergent compositions containing nonionic surfactants in combination with anionic and/or betaine surfactants wherein the nonionic detergent is not the major active surfactant. In U.S. Patent No. 3,658,985 an anionic based shampoo contains a minor amount of a fatty acid alkanolamide. U.S. Patent No. 3,769,398 discloses a betaine-based shampoo containing minor amounts of nonionic surfactants. This patent states that the low foaming properties of nonionic detergents renders its use in shampoo compositions non-preferred. U.S. Patent No. 4,329,335 also discloses a shampoo containing a betaine surfactant as the major ingredient and minor amounts of a nonionic surfactant and of a fatty acid mono- or diethanolamide. U.S. Patent No. 4,259,204 discloses a shampoo comprising 0.8 to 20% by weight of an anionic phosphoric acid ester and one additional surfactant which may be either anionic, amphoteric, or nonionic. U.S. Patent No. 4,329,334 discloses an anionic-amphoteric based shampoo containing a major amount of anionic surfactant and lesser amounts of a betaine and nonionic surfactants.

U.S. Patent No. 3,935,129 discloses a liquid cleaning composition containing an alkali metal silicate, urea, glycerin, triethanolamine, an anionic detergent and a nonionic detergent. The silicate content determines the amount of anionic and/or nonionic detergent in the liquid cleaning composition. However, the foaming properties of these detergent compositions are not discussed therein.

U.S. Patent No. 4,129,515 discloses a heavy duty liquid detergent for laundering fabrics comprising a mixture of substantially equal amounts of anionic and nonionic surfactants, alkanolamines and magnesium salts, and, optionally, zwitterionic surfactants as suds modifiers.

5 U.S. Patent No. 4,224,195 discloses an aqueous detergent composition for laundering socks or stockings comprising a specific group of nonionic detergents, namely, an ethylene oxide of a secondary alcohol, a specific group of anionic detergents, namely, a sulfuric ester salt of an ethylene oxide adduct of a secondary alcohol, and an amphoteric surfactant which may be a betaine, wherein either the  
10 anionic or nonionic surfactant may be the major ingredient.

The prior art also discloses detergent compositions containing all nonionic surfactants as shown in U.S. Patent Nos. 4,154,706 and 4,329,336 wherein the shampoo compositions contain a plurality of particular nonionic surfactants in order to affect desirable foaming and deteritive properties despite the fact that nonionic  
15 surfactants are usually deficient in such properties.

U.S. Patent No. 4,013,787 discloses a piperazine based polymer in conditioning and shampoo compositions which may contain all nonionic surfactant or all anionic surfactant.

U.S. Patent No. 4,450,091 discloses high viscosity shampoo compositions  
20 containing a blend of an amphoteric betaine surfactant, a polyoxybutylenepolyoxyethylene nonionic detergent, an anionic surfactant, a fatty acid alkanolamide and a polyoxyalkylene glycol fatty ester. But, none of the exemplified compositions contain an active ingredient mixture wherein the nonionic detergent is present in major proportion which is probably due to the low foaming properties of the  
25 polyoxybutylene polyoxyethylene nonionic detergent.

U.S. Patent No. 4,595,526 describes a composition comprising a nonionic surfactant, a betaine surfactant, an anionic surfactant and a C<sub>12</sub>-C<sub>14</sub> fatty acid monoethanolamide foam stabilizer.

U.S. Patent 6,147,039 teaches an antibacterial hand cleaning composition having a low surfactant content.

Summary of the Invention

It has now been found that a liquid dish cleaning composition having improved viscosity can be formulated with at least one anionic surfactant, at least one surfactant which is not an anionic, an alkyl polyglucoside surfactant, polyethylene glycol, at least one solubilizer, a Vitamin E acetate, and water which has desirable cleaning and foaming properties.

Another object of this invention is to provide a liquid dish cleaning composition having desirable high foaming and cleaning properties which is beneficial to the human skin.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

Detailed Description of the Invention

This invention relates to a liquid dish cleaning composition which comprises approximately by weight:

(a) 0 to 14%, more preferably 4% to 12% of a magnesium salt of a C<sub>8</sub>-C<sub>16</sub> linear alkyl benzene sulfonate surfactant;

(b) 0 to 8%, more preferably 0.5% to 6% of a sodium salt of a C<sub>8</sub>-C<sub>16</sub> linear alkyl benzene sulfonate surfactant;

(c) 8% to 18% of an ammonium or sodium salt of an ethoxylated C<sub>8</sub>-C<sub>18</sub> alkyl ether sulfate surfactant;

(d) 1% to 20% of at least one surfactant selected from the group consisting of zwitterionic surfactants, C<sub>12</sub>-C<sub>14</sub> fatty acid alkanol amines, amine oxides, ethoxylated

nonionic surfactants and ethoxylated/propoxylated nonionic surfactants and mixtures thereof;

- (e) 0.1% to 5%, more preferably 0.25% to 3% of Vitamin E acetate;
- (f) 1% to 15% of an alkyl polyglucoside surfactant;
- 5 (g) 0.1% to 12%, more preferably 0.5% to 11% of at least one solubilizer;
- (h) 0.005% to 3.0% of a preservative; and
- (i) the balance being water, wherein the composition has a pH of 5 to 7 and has a viscosity of 200 to 800 cps, more preferably 200 to 600 cps at 25°C using a #21 spindle at 20 rpm as measured on a Brookfield RVTDV-II viscometer, wherein the
- 10 composition does not contain any grease release agents such as choline chloride or buffering system which is a nitrogerious buffer which is ammonium or alkaline earth carbonate, guanidine derivates, alkoxyalkyl amines and alkyleneamines C<sub>3</sub>-C<sub>7</sub> alkyl and alkenyl monobasic and dibasic acids such as C<sub>4</sub>-C<sub>7</sub> aliphatic carboxylic diacids which do not contain a hydroxy group, boric acid, phosphoric acid, and amino alkylene
- 15 phosphonic acid.

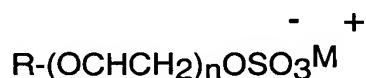
The anionic sulfonate surfactants which may be used in the detergent of this invention are selected from the consisting of water soluble and include the sodium, potassium, ammonium, magnesium and ethanolammonium salts of linear C<sub>8</sub>-C<sub>16</sub> alkyl benzene sulfonates; C<sub>10</sub>-C<sub>20</sub> paraffin sulfonates, alpha olefin sulfonates containing about 10-24 carbon atoms and C<sub>8</sub>-C<sub>18</sub> alkyl sulfates and mixtures thereof.

The paraffin sulfonates may be monosulfonates or di-sulfonates and usually are mixtures thereof, obtained by sulfonating paraffins of 10 to 20 carbon atoms. Preferred paraffin sulfonates are those of C<sub>12</sub>-18 carbon atoms chains, and more preferably they are of C<sub>14</sub>-17 chains. Paraffin sulfonates that have the sulfonate group(s) distributed along the paraffin chain are described in U.S. Patents 2,503,280; 2,507,088; 3,260,744; and 3,372,188; and also in German Patent 735,096. Such compounds may be made to specifications and desirably the content of paraffin sulfonates outside the C<sub>14</sub>-17 range will be minor and will be minimized, as will be any contents of di- or poly-sulfonates.

Examples of suitable other sulfonated anionic detergents are the well known higher alkyl mononuclear aromatic sulfonates, such as the higher alkylbenzene sulfonates containing 9 to 18 or preferably 9 to 16 carbon atoms in the higher alkyl group in a straight or branched chain, or C<sub>8</sub>-15 alkyl toluene sulfonates. A preferred

5 alkylbenzene sulfonate is a linear alkylbenzene sulfonate having a higher content of 3-phenyl (or higher) isomers and a correspondingly lower content (well below 50%) of 2-phenyl (or lower) isomers, such as those sulfonates wherein the benzene ring is attached mostly at the 3 or higher (for example 4, 5, 6 or 7) position of the alkyl group and the content of the isomers in which the benzene ring is attached in the 2 or 1  
 10 position is correspondingly low. Preferred materials are set forth in U.S. Patent 3,320,174, especially those in which the alkyls are of 10 to 13 carbon atoms.

The C<sub>8</sub>-18 ethoxylated alkyl ether sulfate surfactants have the structure



15 wherein n is about 1 to about 22 more preferably 1 to 3 and R is an alkyl group having about 8 to about 18 carbon atoms, more preferably 12 to 15 and natural cuts, for example, C<sub>12</sub>-14 or C<sub>12</sub>-16 and M is an ammonium cation or a metal cation, most preferably sodium.

The ethoxylated alkyl ether sulfate may be made by sulfating the condensation product of ethylene oxide and C<sub>8</sub>-10 alkanol, and neutralizing the resultant product.

The ethoxylated alkyl ether sulfates differ from one another in the number of carbon atoms in the alcohols and in the number of moles of ethylene oxide reacted with one mole of such alcohol. Preferred ethoxylated alkyl ether polyethenoxy sulfates contain 12 to 15 carbon atoms in the alcohols and in the alkyl groups thereof, e.g., sodium myristyl (3 EO) sulfate.

Ethoxylated C<sub>8</sub>-18 alkylphenyl ether sulfates containing from 2 to 6 moles of ethylene oxide in the molecule are also suitable for use in the invention compositions. These detergents can be prepared by reacting an alkyl phenol with 2 to 6 moles of ethylene oxide and sulfating and neutralizing the resultant ethoxylated alkylphenol. The

concentration of the ethoxylated alkyl ether sulfate surfactant is about 1 to about 8 wt. %.

The water soluble nonionic surfactants which is utilized in this invention are commercially well known and include the primary aliphatic alcohol ethoxylates, 5 secondary aliphatic alcohol ethoxylates, alkylphenol ethoxylates and ethylene-oxide-propylene oxide condensates on primary alkanols, such a Plurafacs (BASF) and condensates of ethylene oxide with sorbitan fatty acid esters such as the Tweens (ICI). The nonionic synthetic organic detergents generally are the condensation products of an organic aliphatic or alkyl aromatic hydrophobic compound and hydrophilic ethylene 10 oxide groups. Practically any hydrophobic compound having a carboxy, hydroxy, amido, or amino group with a free hydrogen attached to the nitrogen can be condensed with ethylene oxide or with the polyhydration product thereof, polyethylene glycol, to form a water-soluble nonionic detergent. Further, the length of the polyethenoxy chain can be adjusted to achieve the desired balance between the hydrophobic and 15 hydrophilic elements.

The nonionic detergent class includes the condensation products of a higher alcohol (e.g., an alkanol containing 8 to 18 carbon atoms in a straight or branched chain configuration) condensed with 5 to 30 moles of ethylene oxide, for example, lauryl or myristyl alcohol condensed with 16 moles of ethylene oxide (EO), tridecanol condensed 20 with 6 to 8 moles of EO, myristyl alcohol condensed with about 10 moles of EO per mole of myristyl alcohol, the condensation product of EO with a cut of coconut fatty alcohol containing a mixture of fatty alcohols with alkyl chains varying from 10 to 14 carbon atoms in length and wherein the condensate contains either 6 moles of EO per mole of total alcohol or 9 moles of EO per mole of alcohol and tallow alcohol ethoxylates 25 containing 6 EO to 11 EO per mole of alcohol.

A preferred group of the foregoing nonionic surfactants are the Neodol ethoxylates (Shell Co.), which are higher aliphatic, primary alcohols containing about 9-15 carbon atoms, such as C<sub>9</sub>-C<sub>11</sub> alkanol condensed with 8 moles of ethylene oxide (Neodol 91-8), C<sub>12</sub>-C<sub>13</sub> alkanol condensed with 6.5 moles ethylene oxide (Neodol 23-

6.5), C<sub>12</sub>-15 alkanol condensed with 12 moles ethylene oxide (Neodol 25-12), C<sub>14</sub>-15 alkanol condensed with 13 moles ethylene oxide (Neodol 45-13), and the like. Such ethoxamers have an HLB (hydrophobic lipophilic balance) value of 8-15 and give good/W emulsification, whereas ethoxamers with HLB values below 8 contain less than

5 5 ethyleneoxy groups and tend to be poor emulsifiers and poor detergents.

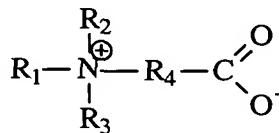
Additional satisfactory water soluble alcohol ethylene oxide condensates are the condensation products of a secondary aliphatic alcohol containing 8 to 18 carbon atoms in a straight or branched chain configuration condensed with 5 to 30 moles of ethylene oxide. Examples of commercially available nonionic detergents of the foregoing type  
10 are C<sub>11</sub>-C<sub>15</sub> secondary alkanol condensed with either 9 EO (Tergitol 15-S-9) or 12 EO (Tergitol 15-S-12) marketed by Union Carbide.

Other suitable nonionic detergents include the polyethylene oxide condensates of one mole of alkyl phenol containing from 8 to 18 carbon atoms in a straight- or branched chain alkyl group with 5 to 30 moles of ethylene oxide. Specific examples of  
15 alkyl phenol ethoxylates include nonyl condensed with 9.5 moles of EO per mole of nonyl phenol, dinonyl phenol condensed with 12 moles of EO per mole of phenol, dinonyl phenol condensed with 15 moles of EO per mole of phenol and di-isooctylphenol condensed with 15 moles of EO per mole of phenol. Commercially available nonionic surfactants of this type include Igepal CO-630 (nonyl phenol ethoxylate) marketed by  
20 GAF Corporation.

Also among the satisfactory nonionic detergents are the water-soluble condensation products of a C<sub>8</sub>-C<sub>20</sub> alkanol with a heteric mixture of ethylene oxide and propylene oxide wherein the weight ratio of ethylene oxide to propylene oxide is from 2.5:1 to 4:1, preferably 2.8:1-3.3:1, with the total of the ethylene oxide and propylene  
25 oxide (including the terminal ethanol or propanol group) being from 60-85%, preferably 70-80%, by weight. Such detergents are commercially available from BASF-Wyandotte and a particularly preferred detergent is a C<sub>10</sub>-C<sub>16</sub> alkanol condensate with ethylene oxide and propylene oxide, the weight ratio of ethylene oxide to propylene oxide being 3:1 and the total alkoxy content being 75% by weight.

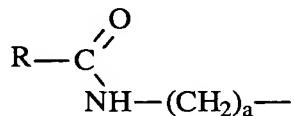
Other suitable water-soluble nonionic detergents which are less preferred are marketed under the trade name "Pluronics." The compounds are formed by condensing ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. The molecular weight of the hydrophobic portion 5 of the molecule is of the order of 950 to 4000 and preferably 200 to 2,500. The addition of polyoxyethylene radicals to the hydrophobic portion tends to increase the solubility of the molecule as a whole so as to make the surfactant water-soluble. The molecular weight of the block polymers varies from 1,000 to 15,000 and the polyethylene oxide content may comprise 20% to 80% by weight. Preferably, these surfactants will be in 10 liquid form and satisfactory surfactants are available as grades L62 and L64.

The water-soluble zwitterionic surfactant, which can also be used provides good foaming properties and mildness to the present nonionic based liquid detergent. The zwitterionic surfactant is a water soluble betaine having the general formula:



15

wherein  $\text{R}_1$  is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms, or the amido radical:

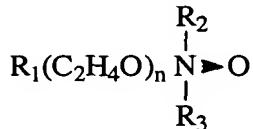


20 wherein R is an alkyl group having 9 to 19 carbon atoms and a is the integer 1 to 4;  $\text{R}_2$  and  $\text{R}_3$  are each alkyl groups having 1 to 3 carbons and preferably 1 carbon;  $\text{R}_4$  is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group. Typical alkyldimethyl betaines include decyl dimethyl betaine or 2-(N-decyl-N, N-dimethyl-ammonia) acetate, coco dimethyl betaine or 2-(N-coco N, N-dimethylammonio) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, lauryl diemethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine, etc. The 25

amidobetaines similarly include cocoamidoethylbetaine, cocoamidopropyl betaine and the like. A preferred betaine is coco (C<sub>8</sub>-C<sub>18</sub>) amidopropyl dimethyl betaine.

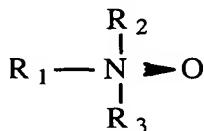
Amine oxide semi-polar nonionic surfactants comprise compounds and mixtures of compounds having the formula:

5



wherein R<sub>1</sub> is an alkyl, 2-hydroxyalkyl, 3-hydroxyalkyl, or 3-alkoxy-2-hydroxypropyl radical in which the alkyl and alkoxy, respectively, contain from 8 to 18 carbon atoms, R<sub>2</sub> and R<sub>3</sub> are each methyl, ethyl, propyl, isopropyl, 2-hydroxyethyl, 2-hydroxypropyl, or

10 3-hydroxypropyl, and n is from 0 to 10. Particularly preferred are amine oxides of the formula:



15 wherein R<sub>1</sub> is a C<sub>12</sub>-16 alkyl and R<sub>2</sub> and R<sub>3</sub> are methyl or ethyl. The above ethylene oxide condensates, amides, and amine oxides are more fully described in U.S. Pat. No. 4,316,824 which is hereby incorporated herein by reference.

The instant composition can contain a mixture of a C<sub>12</sub>-14 alkyl monoalkanol amide such as lauryl monoalkanol amide and a C<sub>12</sub>-14 alkyl dialkanol amide such as 20 lauryl diethanol amide or coco diethanol amide.

The alkyl polysaccharides surfactants, which are used in conjunction with the aforementioned surfactants have a hydrophobic group containing from about 8 to about 20 carbon atoms, preferably from about 10 to about 16 carbon atoms, most preferably from about 12 to about 14 carbon atoms, and polysaccharide hydrophilic group containing from about 1.5 to about 10, preferably from about 1.5 to about 4, most preferably from about 1.6 to about 2.7 saccharide units (e.g., galactoside, glucoside, fructoside, glucosyl, fructosyl; and/or galactosyl units). Mixtures of saccharide moieties may be used in the alkyl polysaccharide surfactants. The number x indicates the

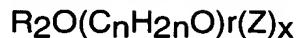
number of saccharide units in a particular alkyl polysaccharide surfactant. For a particular alkyl polysaccharide molecule x can only assume integral values. In any physical sample of alkyl polysaccharide surfactants there will be in general molecules having different x values. The physical sample can be characterized by the average 5 value of x and this average value can assume non-integral values. In this specification the values of x are to be understood to be average values. The hydrophobic group (R) can be attached at the 2-, 3-, or 4- positions rather than at the 1-position, (thus giving e.g. a glucosyl or galactosyl as opposed to a glucoside or galactoside). However, attachment through the 1- position, i.e., glucosides, galactoside, fructosides, etc., is 10 preferred. In the preferred product the additional saccharide units are predominately attached to the previous saccharide unit's 2-position. Attachment through the 3-, 4-, and 6- positions can also occur. Optionally and less desirably there can be a polyalkoxide chain joining the hydrophobic moiety (R) and the polysaccharide chain. The preferred alkoxide moiety is ethoxide.

15        Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from about 8 to about 20, preferably from about 10 to about 18 carbon atoms. Preferably, the alkyl group is a straight chain saturated alkyl group. The alkyl group can contain up to 3 hydroxy groups and/or the polyalkoxide chain can contain up to about 30, preferably less than about 10, alkoxide moieties.

20        Suitable alkyl polysaccharides are decyl, dodecyl, tetradecyl, pentadecyl, hexadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexaglucosides, galactosides, lactosides, fructosides, fructosyls, lactosyls, glucosyls and/or galactosyls and mixtures thereof.

25        The alkyl monosaccharides are relatively less soluble in water than the higher alkyl polysaccharides. When used in admixture with alkyl polysaccharides, the alkyl monosaccharides are solubilized to some extent. The use of alkyl monosaccharides in admixture with alkyl polysaccharides is a preferred mode of carrying out the invention. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentaglucosides and tallow alkyl tetra-, penta-, and hexaglucosides.

The preferred alkyl polysaccharides are alkyl polyglucosides having the formula



wherein Z is derived from glucose, R is a hydrophobic group selected from the group consisting of alkyl, alkylphenyl, hydroxyalkylphenyl, and mixtures thereof in which said

5 alkyl groups contain from about 10 to about 18, preferably from about 12 to about 14 carbon atoms; n is 2 or 3 preferably 2, r is from 0 to 10, preferable 0; and x is from 1.5 to 8, preferably from 1.5 to 4, most preferably from 1.6 to 2.7. To prepare these compounds a long chain alcohol ( $R_2OH$ ) can be reacted with glucose, in the presence of an acid catalyst to form the desired glucoside. Alternatively the alkyl polyglucosides  
10 can be prepared by a two step procedure in which a short chain alcohol ( $R_1OH$ ) can be reacted with glucose, in the presence of an acid catalyst to form the desired glucoside. Alternatively the alkyl polyglucosides can be prepared by a two step procedure in which a short chain alcohol (C<sub>1-6</sub>) is reacted with glucose or a polyglucoside (x=2 to 4) to yield a short chain alkyl glucoside (x=1 to 4) which can in turn be reacted with a longer  
15 chain alcohol ( $R_2OH$ ) to displace the short chain alcohol and obtain the desired alkyl polyglucoside. If this two step procedure is used, the short chain alkylglucosde content of the final alkyl polyglucoside material should be less than 50%, preferably less than 10%, more preferably less than about 5%, most preferably 0% of the alkyl polyglucoside.

20 The amount of unreacted alcohol (the free fatty alcohol content) in the desired alkyl polysaccharide surfactant is preferably less than about 2%, more preferably less than about 0.5% by weight of the total of the alkyl polysaccharide. For some uses it is desirable to have the alkyl monosaccharide content less than about 10%.

25 The used herein, "alkyl polysaccharide surfactant" is intended to represent both the preferred glucose and galactose derived surfactants and the less preferred alkyl polysaccharide surfactants. Throughout this specification, "alkyl polyglucoside" is used to include alkyl polyglycosides because the stereochemistry of the saccharide moiety is changed during the preparation reaction.

An especially preferred APG glycoside surfactant is APG 625 glycoside manufactured by the Cognis Corporation of Ambler, PA. APG25 is a nonionic alkyl polyglycoside characterized by the formula:



5 wherein n=10 (2%); n=122 (65%); n=14 (21-28%); n=16 (4-8%) and n=18 (0.5%) and x (degree of polymerization) = 1.6. APG 625 has: a pH of 6 to 10 (10% of APG 625 in distilled water); a specific gravity at 25°C of 1.1 g/ml; a density at 25°C of 9.1 lbs/gallon; a calculated HLB of 12.1 and a Brookfield viscosity at 35°C, 21 spindle, 5-10 RPM of 3,000 to 7,000 cps.

10 As used herein and in the appended claims the term "perfume" is used in its ordinary sense to refer to and include any non-water soluble fragrant substance or mixture of substances including natural (i.e., obtained by extraction of flower, herb, blossom or plant), artificial (i.e., mixture of natural oils or oil constituents) and synthetically produced substance) odoriferous substances. Typically, perfumes are

15 complex mixtures of blends of various organic compounds such as alcohols, aldehydes, ethers, aromatic compounds and varying amounts of essential oils (e.g., terpenes) such as from 0% to 80%, usually from 10% to 70% by weight, the essential oils themselves being volatile odoriferous compounds and also serving to dissolve the other components of the perfume.

20 In the present invention the precise composition of the perfume is of no particular consequence to cleaning performance so long as it meets the criteria of water immiscibility and having a pleasing odor. Naturally, of course, especially for cleaning compositions intended for use in the home, the perfume, as well as all other ingredients, should be cosmetically acceptable, i.e., non-toxic, hypoallergenic, etc..

25 The instant compositions show a marked improvement in ecotoxicity as compared to existing commercial products.

In place of the perfume one can employ an essential oil or a water insoluble hydrocarbon having 6 to 18 carbon such as a paraffin or isoparaffin.

Suitable essential oils are selected from the group consisting of:

Anethole 20/21 natural, Aniseed oil china star, Aniseed oil globe brand, Balsam (Peru),  
Basil oil (India), Black pepper oil, Black pepper oleoresin 40/20, Bois de Rose (Brazil)  
FOB, Borneol Flakes (China), Camphor oil, White, Camphor powder synthetic technical,  
Cananga oil (Java), Cardamom oil, Cassia oil (China), Cedarwood oil (China) BP,

5 Cinnamon bark oil, Cinnamon leaf oil, Citronella oil, Clove bud oil, Clove leaf, Coriander  
(Russia), Coumarin 69°C (China), Cyclamen Aldehyde, Diphenyl oxide, Ethyl vanillin,  
Eucalyptol, Eucalyptus oil, Eucalyptus citriodora, Fennel oil, Geranium oil, Ginger oil,  
Ginger oleoresin (India), White grapefruit oil, Guaiacwood oil, Gurjun balsam,  
Heliotropin, Isobornyl acetate, Isolongifolene, Juniper berry oil, L-methyl acetate,

10 Lavender oil, Lemon oil, Lemongrass oil, Lime oil distilled, Litsea Cubeba oil,  
Longifolene, Menthol crystals, Methyl cedryl ketone, Methyl chavicol, Methyl salicylate,  
Musk ambrette, Musk ketone, Musk xylol, Nutmeg oil, Orange oil, Patchouli oil,  
Peppermint oil, Phenyl ethyl alcohol, Pimento berry oil, Pimento leaf oil, Rosalin,  
Sandalwood oil, Sandenol, Sage oil, Clary sage, Sassafras oil, Spearmint oil, Spike

15 lavender, Tagetes, Tea tree oil, Vanilin, Vetyver oil (Java), Wintergreen, Allocimene,  
Arbanex™, Arbanol®, Bergamot oils, Camphene, Alpha-Campholenic aldehyde, I-  
Carvone, Cineoles, Citral, Citronellol Terpenes, Alpha-Citronellol, Citronellyl Acetate,  
Citronellyl Nitrile, Para-Cymene, Dihydroanethole, Dihydrocarveol, d-Dihydrocarvone,  
Dihydrolinalool, Dihydromyrcene, Dihydromycenol, Dihydromyrcenyl Acetate,

20 Dihydroterpineol, Dimethyloctanal, Dimethyloctanol, Dimethyloctanyl Acetate,  
Estragole, Ethyl-2 Methylbutyrate, Fenchol, Fernlol™, Florilys™, Geraniol, Geranyl  
Acetate, Geranyl Nitrile, Glidmint™ Mint oils, Glidox™, Grapefruit oils, trans-2-Hexenal,  
trans-2-Hexenol, cis-3-Hexenyl Isovalerate, cis-3-Hexanyl-2-methylbutyrate, Hexyl  
Isovalerate, Hexyl-2-methylbutyrate, Hydroxycitronellal, Ionone, Isobornyl Methylether,

25 Linalool, Linalool Oxide, Linalyl Acetate, Menthane Hydroperoxide, I-Methyl Acetate,  
Methyl Hexyl Ether, Methyl-2-methylbutyrate, 2-Methylbutyl Isovalerate, Myrcene,  
Nerol, Neryl Acetate, 3-Octanol, 3-Octyl Acetate, Phenyl Ethyl-2-methylbutyrate,  
Petitgrain oil, cis-Pinane, Pinane Hydroperoxide, Pinanol, Pine Ester, Pine Needle oils,  
Pine oil, alpha-Pinene, beta-Pinene, alpha-Pinene Oxide, Plinol, Plinyl Acetate, Pseudo

Ionone, Rhodinol, Rhodinyl Acetate, Spice oils, alpha-Terpinene, gamma-Terpinene, Terpinene-4-OL, Terpineol, Terpinolene, Terpinyl Acetate, Tetrahydrolinalool, Tetrahydrolinalyl Acetate, Tetrahydromyrcenol, Tetralol<sup>®</sup>, Tomato oils, Vitalizair, Zestoral<sup>TM</sup>.

5       The instant light duty liquid nonmicroemulsion compositions can contain about 0.1 wt. % to about 12 wt. %, more preferably about 0.5 wt. % to about 11 wt. %, of at least one solubilizer selected from the group consisting of a C<sub>2</sub>-5 mono, dihydroxy or polyhydroxy alkanols such as ethanol, isopropanol, glycerol ethylene glycol, diethylene glycol, propylene glycol, and hexylene glycol and mixtures thereof, and an alkali metal  
10 cumene or xylene sulfonates such as sodium cumene sulfonate and sodium xylene sulfonate. The solubilizing agents are included in order to control low temperature cloud clear properties. The composition can optionally include 0.1 wt. % to 3 wt. % of urea as a supplemental solubilizer. The composition can also optionally include 0.1 wt. % to 5 wt. % of magnesium sulfate.

15       The instant formulas explicitly exclude alkali metal silicates and alkali metal builders such as alkali metal polyphosphates, alkali metal carbonates, alkali metal phosphonates and alkali metal citrates because these materials, if used in the instant composition, would cause the composition to have a high pH as well as leaving residue on the surface being cleaned.

20       The final essential ingredient in the inventive compositions having improved interfacial tension properties is water. The proportion of water in the compositions generally is in the range of 10% to 95%.

25       The liquid cleaning composition of this invention may, if desired, also contain other components either to provide additional effect or to make the product more attractive to the consumer. The following are mentioned by way of example: Colors or dyes in amounts up to 0.5% by weight; fragrances in amounts up to 1.5% by weight; bactericides in amounts up to 1% by weight; UV absorbents, or antioxidantizing agents, EDTA, HEDTA, DTPA, for color improvement under stressed sun conditions, up to 1% and pH adjusting agents, such as sulfuric acid or sodium hydroxide, as needed.

Furthermore, if opaque compositions are desired, up to 4% by weight of an opacifier may be added. Aloe vera gel can be optionally used at a concentration of about 0.05% to 0.3% by weight.

Preservatives which can be used in the instant compositions at a concentration of 0.005 wt. % to 3 wt. %, more preferably 0.01 wt. % to 2.5 wt. % are: benzalkonium chloride; benzethonium chloride, 5-bromo-5-nitro-1,3dioxane; 2-bromo-2-nitropropane-1,3-diol; alkyl trimethyl ammonium bromide; N-(hydroxymethyl)-N-(1,3-dihydroxy methyl)-2,5-dioxo-4-imidaxolidinyl-N'-(hydroxy methyl) urea; 1-3-dimethyol-5,5-dimethyl hydantoin; formaldehyde; iodopropynl butyl carbamata, butyl paraben; ethyl paraben; 10 methyl paraben; propyl paraben, mixture of methyl isothiazolinone/methyl-chloroisothiazoline in a 1:3 wt. ratio; mixture of phenoxyethanol/butyl paraben/methyl paraben/propylparaben; 2-phenoxyethanol; tris-hydroxyethyl-hexahydrotriazine; methylisothiazolinone; 5-chloro-2-methyl-4-isothiazolin-3-one; 1,2-dibromo-2, 4-dicyanobutane; 1-(3-chloroalkyl)-3,5,7-traza-azoniaadamantane chloride; and sodium 15 benzoate. PH adjusting agents such as sulfuric acid or sodium hydroxide can be used as needed.

In final form, the instant compositions exhibit stability at reduced and increased temperatures. More specifically, such compositions remain clear and stable in the range of 0°C to 50°C, especially 5°C to 43°C. Such compositions exhibit a pH of 5 to 7.

20 The following examples illustrate the liquid cleaning compositions of the described invention. Unless otherwise specified, all percentages are by weight. The exemplified compositions are illustrative only and do not limit the scope of the invention. Unless otherwise specified, the proportions in the examples and elsewhere in the specification are by weight.

25

#### Example 1

The following compositions are listed as a wt. %.

	A	B	C	D
MgLAS	9.0	9.0	--	--
NaLAS	3.0	3.0	--	--

NH4 AEOS 1.3EO	11.5	11.5	--	--
Na AEOS 1.3EO	--	--	14.7	14.7
APG	10.0	10.0	4.41	4.41
LMMEA	--	--	2.94	2.94
LM Amineoxide	5.4	5.4	--	--
Betaine	--	--	4.41	4.41
Neodol 9-1	--	--	14.7	14.7
Dowicil 75	--	--	0.04	0.04
Na3HEDTA	--	--	0.125	0.125
DTPA (pentasodium pentetate)	0.125	0.125	--	--
Sodium bisulfite	0.075	0.075	0.075	0.075
Sodium formate	--	--	1.1	1.1
Alcohol	6.3	6.3	5.24	5.24
SXS	3.5	3.5	1.81	1.81
MgSO4	--	--	0.75	0.75
Urea	--	--	1.5	1.5
Vitamin E acetate <sup>1</sup>	0.50	1.0	0.50	1.0
Color	0.004	0.004	0.00008	0.00008
Perfume	0.37	0.37	0.375	0.375
Aloe Vera Gel	--	--	0.1	0.1
Water	Bal.	Bal.	Bal.	Bal.
pH	6.8	6.8	5.2	5.2
Deposition on wool ( $\mu\text{g/ml}$ )	4.54	6.09	1.125	2.24

<sup>1</sup>Vitamin E Acetate (Alpha-Tocopheryl Acetate) CAS: 000058-95-7, Formula

C<sub>31</sub>H<sub>52</sub>O<sub>3</sub>, MW: 472.75

#### Wool Deposition Experimental Procedure

##### - Preparation of Wool:

5        1.       Cut the 3" x 6" wool swatches into six pieces. The area for each wool swatch, is 1.5" x 1.5" = 2.25 in<sup>2</sup> 14.52 cm<sup>2</sup> which is approximately equal to 0.1700 gms of weight. Weight and trim with scissors each piece to 0.1600 gms. Bisect it into 8 pieces.

10      2.       Rinse each piece of wool under 95 to 100 deg. F. Gently flow tap water for 15 seconds over them.

##### - Dosing the Wool (LDL product onto wool):

15      3a.      (application step) With non-latex gloves on, place one swatch onto palm of left hand. Apply 300  $\mu\text{L}$  of test solution onto wool in hand, for 15 seconds using the pipette tip. Using other hand generate a lather for 45 seconds only on the wool as if you were washing your own hands.

3b. (rinse step) Rinse with 95 to 100 deg. F tap water under gentle flow for 30 seconds.

4. Allow the wool to dry for 30 minutes on a paper towel before the extraction.

5 Extraction:

5. Put wool swatch into 20 mL scintillation vial. Add 10 mL of methanol into each cell. Vortex for 1 minute and place into mixer/shaker at 50 deg. C for 1 hour setting the gentle mixer table at 75 rpm.

6. After mixing, take out wool swatch and squeeze out remaining by hand  
10 with non-latex gloves.

- Sample preparation:

7. Place all the vials on a lab rack. Turn on heat to 60 deg. C and let mix slowly overnight.

- Filtration:

15 8. By next day the 10 mL of methanol should have evaporated.

9. Using a 1.0 mL positive displacement pipette decant 2.0 mL of methanol into and along the sides of each vial. Be sure to rotate the vial slowly by hand then filter with 5 cc syringes attached to 0.45  $\mu$ L filters into the small amber HPLC vials. Label each vial and place septum on top, red side down, and screw on yellow cap. We are  
20 now ready for the chromatography part.

- Calculations/Statistics:

The concentration ( $\mu$ g/ml) of LDL deposited on wool is determined by HPLC. Six replicates were run for each product. Tukey-Kramer HSD, at 95% c.l. was performed to determine the average values and statistical significance.

25 HPLC detection

The methodology was based on Colgate-Palmolive SPI LAB 1105 "Vitamin E, Vitamin E Acetate and Vitamin A Palmitate In Personal Care Liquids and Bar Soaps by Non-Aqueous Reverse Phase". this method was a non-aqueous reversed phase separation and was modified in order to optimize the separation of matrix interferences.

Preliminary method investigation was conducted on a Waters Millennium System composed of a Waters 600 pump, Waters 717 autosamplers, and a Waters 996 diode array detector. Subsequent work was conducted on a Shimadzu 10ATvp system.

The HPLC column employed was a Polaris C18-A with a 3 micron particle size,  
5 4.6 diameter and 50mm length. The mobile phase was 100% LPLC grade methanol and was delivered at a flow rate of 1mL/minute. The Vitamin E-acetate was detected by UV adsorption at 200nm. Calibration standard solutions and sample solutions were injected at 20 uL. The run time for the separation was set at 5 minutes.

The wool deposition extract was chromatographed neat, without further sample  
10 preparation. Three calibration solutions were prepared to cover the concentration range between 1.4ug/mL to 56ug/mL. The calibration curve was found to be linear with a correlation coefficient of 0.9999. The level of Vitamin E-acetate was quantitated by relating its peak area in the calibration solutions to the areas found in the samples. No interference was detected in the placebo solutions.